

**METHODS, APPARATUS AND COMPUTER PROGRAM PRODUCTS
FOR AUTOMATICALLY GENERATING NURBS MODELS OF
TRIANGULATED SURFACES USING HOMEOMORPHISMS**

Abstract of the Disclosure

Embodiments automatically generate an accurate network of watertight NURBS patches from polygonal models of objects while automatically detecting and preserving character lines thereon. These embodiments generate from an initial triangulation of the surface, a hierarchy of progressively coarser triangulations of the surface by performing a sequence of edge contractions using a greedy algorithm that selects edge contractions by their numerical properties. Operations are also performed to connect the triangulations in the hierarchy using homeomorphisms that preserve the topology of the initial triangulation in the coarsest triangulation. A desired quadrangulation of the surface can then be generated by homeomorphically mapping edges of a coarsest triangulation in the hierarchy back to the initial triangulation. This quadrangulation is topologically consistent with the initial triangulation and is defined by a plurality of quadrangular patches. These quadrangular patches are linked together by a (U, V) mesh that is guaranteed to be continuous at patch boundaries. A grid is then preferably fit to each of the quadrangles in the resulting quadrangulation by decomposing each of the quadrangles into k^2 smaller quadrangles. A watertight NURBS model may be generated from the resulting quadrangulation.